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| EXAMINER | |
|---|---|
| UHLIR, NIKOLAS J | |
| **ART UNIT** | **PAPER NUMBER** |
| 1773 | 5 |

DATE MAILED: 08/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/749,473 | IKEDA, HIROYUKI | |
| | Examiner | Art Unit | |
| | Nikolas J. Uhlir | 1773 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-14 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-14 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

## DETAILED ACTION

### *Priority*

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### *Claim Rejections - 35 USC § 112*

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 2 recites the limitation "the adjacent soft magnetic layers." in lines 3-4 of the claim. There is insufficient antecedent basis for this limitation in the claim. Correction is required.

### *Claim Rejections - 35 USC § 102*

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

6. Claims 1, and 10-11, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Hokkyo et al. (US6387483) as evidenced by Konica (JP0521714) and Ikeda (US3863268).

7. Hokkyo et al. teaches a perpendicular magenetic recording medium used as a magnetic tape or a magnetic disk (column 1, lines 5-10). In a first embodiment, Hokkyo et al. describes a perpendicular recording media that comprises a substrate, a smoothness control layer formed on the substrate, a soft magnetic film formed on the smoothness control layer, and a perpendicular magnetic recording layer formed on the soft magnetic layer. The smoothness control layer possesses excellent surface smoothness, which results in both the soft magnetic layer and the perpendicular magnetic recording layer having improved smoothness (column 2, lines 10-21). The smoothness control layer is typically a layer of chromium, but can be manufactured from many different types of materials, such as titanium, carbon, chromium containing alloys, titanium containing alloys, carbon containing alloys etc... (column 2, lines 48-60). The soft magnetic layer is formed from a FeSiAl, alloy, which is well known in the art as Sendust. Sendust is well known in the art to have a permeability $\mu_i$ of ~200 H/m (As evidenced by Konica, see Abstract), and a coercivity of .025 oersted (evidenced by Ikeda, column 3, lines 40-45). The thickness of the soft magnetic layer is typically ~520nm (5200 angstroms) (See example, column 9, lines 16+). Thus, the soft magnetic layer taught by Hokkyo exhibits a $\mu_{max} * t$ = 1,000,000 (H*a/m). Hokkyo et al. further teaches that the thickness of the chromium layer is typically between 1-17nm (column 3, lines 25-35) and the thickness of the perpendicular magnetic recording layer is

typically 20-150nm (column 2, lines 39-42). Hokkyo et al. teaches a specific example wherein a 10nm or 20nm $Cr_{80}Ti_{10}C_{10}$ (at %) alloy is formed on a glass substrate, a 520nm FeSiAl soft magnetic layer is formed over the Chromium alloy layer, and a 100nm $Co_{78}Cr_{19}Ta_3$ perpendicular magnetic recording layer is deposited on the soft magnetic layer (column 12 example 1, and column 15, example 3). Referring to Figure 28, Hokkyo et al. teachers that for a 10nm thick Chromium alloy layer, the average roughness $R_a$ of the perpendicular magnetic recording media is 1.09nm (10.9 angstroms), whereas for a 20nm chromium alloy layer, the perpendicular magnetic recording layer has an average surface roughness of 1.62nm (16.2 angstroms).

***Claim Rejections - 35 USC § 103***

8. Claims 1-7, 9-10 and 12-13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. (US4687712) in view of Hokkyo et al. (US6387483).

9. Sugita et al. teaches a vertical (perpendicular) magnetic recording medium comprising a substrate that has been coated with alternating layers of permalloy and a non-magnetic layer, wherein a vertical magnetic recording medium is deposited on the outermost permalloy layer (column 2, line 65-column 3, line 10). It is well known in the art that Permalloy is a soft magnetic material. Sugita et al. specifically teaches an example, wherein a 50μm thick polymer substrate is coated with a triple layer structure of permalloy/non-magnetic material, wherein the triple layer comprises a 600 angstrom thick upper permalloy layer, a 600 angstrom thick intermediate permalloy layer, a 2000 angstrom thick lower permalloy layer, a150 angstrom thick titanium layer positioned between the upper permalloy layer and the intermediate permalloy layer, a 150

angstrom thick titanium layer positioned between the lower permalloy layer and the intermediate permalloy layer, and a Co-Cr perpendicular recording layer on the upper permalloy layer (column 6, lines 22-35). In this particular example, the ratio of total permalloy thickness/total separator thickness is 1/.09375 (3200/300). Lastly, Permalloy is well known in the art to be comprised of various NiFe alloys. The applicant admits on page 11 of the specification that NiFe alloys have a μmax of ~330H/m. Thus, for the example above wherein 3200 angstroms of permalloy employed, the soft magnetic material will exhibit a μmax*t of 1056000 H*a/m

Sugita et al. does not teach a magnetic recording medium wherein a non-magnetic substrate is coated with multiple alternating layers of a soft magnetic material and a non-magnetic separator layer, wherein the magnetic recording medium has an average surface roughness $R_a \leq 50$ angstroms.

Hokkyo et al. teaches a perpendicular magnetic recording medium that exhibits exceptionally good smoothness. Hokkyo et al. teaches a perpendicular magnetic media that comprises a substrate that has been coated with a thin smoothness control layer, wherein the smoothness control layer is further coated with a soft magnetic layer and the soft magnetic layer is coated with a perpendicular magnetic recording layer (column 2, lines 8-14). Hokkyo et al. teaches that in perpendicular magnetic recording media, poor surface smoothness of the soft magnetic layer degrades the perpendicular orientation of the perpendicular magnetic layer formed on the soft magnetic layer (column 1, lines 60-67). The smoothness control layer possesses excellent surface smoothness, which results in subsequent layers formed on top of the smoothness

control layer also exhibiting improved smoothness (column 2, lines 15-25). These smoothness control layers are typically 1-17nm thick (column 3, line 17), and comprised of chromium, titanium, carbon, or alloys containing one or more of these elements (column 2, lines 50-60). The magnetic media with improved surface smoothness exhibits higher recording density, lowered noise, and improved read output voltage (column 2, lines 23-25). Regarding claim 1, wherein the applicant requires that the magnetic media have a roughness $\leq$50 angstroms. Referring to figures 7 and 8, Hokkyo et al. clearly shows that the smoothness control layer improves the roughness of the soft magnetic layer, and also shows that there is a strong correlation between the roughness of the magnetic recording layer and the roughness of the soft magnetic underlayer film. Thus, as the smoothness control layer serves to improve the surface roughness of the soft magnetic layer, it necessarily improves the smoothness of the magnetic recording layer (column 10, lines 34-47). More specifically, as the roughness of the smoothness control layer increases, the roughness of subsequent layers increases, whereas if the roughness of the smoothness control layer decreases, the smoothness of subsequent layers also decreases. Improved surface smoothness results in the media exhibiting higher recording density lowered noise, and improved read output voltage (column 2, lines 23-25). Thus, the examiner takes the position that the smoothness of the magnetic smoothness control layer is a results effective variable, and it would have been obvious to one of ordinary skill in the art to optimize the smoothness control layer to be as smooth as possible in order to obtain a magnetic recording layer that is as smooth as possible.

Therefore it would have been obvious to one with ordinary skill in the art at the time the invention was made to coat use a 1-17nm thick layer of Cr, Ti, C, or an alloy containing these elements described by Hokkyo et al. as a base layer between the substrate and the first soft magnetic layer taught by Sugita et al, in order to obtain a perpendicular magnetic recording media that exhibits improved smoothness.

One would have been motivated to make this modification due to the teaching in Hokkyo et al. that utilizing a 1-17nm layer of Cr, C, Ti, or an alloy of these elements as a baselayer of a perpendicular magnetic recording media results in the media exhibiting improved smoothness, which results in the media exhibiting lower noise, improved read output voltage, and higher recording density.

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. as modified by Hokkyo et al. as applied to claims 1-7, 9-10 and 12-13 above, and further in view of Lal et al. (US5834111).

Sugita et al. as modified by Hokkyo et al. teaches all of the limitations of claim 8 as written above, except for those limitations stated below.

Sugita et al. as modified by Hokkyo et al. does not teach a magnetic recording medium that comprise a substrate that has been coated with a plurality of alternating layers of a soft magnetic layer and a separation layer, wherein the separation layer comprises chromium or an alloy containing chromium as the main component.

Lal et al. teaches a magnetic recording medium comprising a substrate, a chromium underlayer formed on the substrate, a multilayer magnetic film comprising 1st and 2nd magnetic layers formed on the chromium underlayer, an isolation layer

between the first and second magnetic layers, and a wear resistant over coat (column 1, lines 62-67). The non-magnetic isolation layer is manufactured from one of chromium, titanium, molybdenum, zirconium aluminum, etc.... (Column 4, lines 8-15)

Therefore it would have been obvious to one of ordinary skill at the time the invention was made to substitute chromium for titanium as the spacer layers in the multilayer magnetic media taught by Sugita et al. as modified by Hokkyo et al.

One would have been motivated to make this modification due to the teaching in Lal et al. that titanium and chromium are equivalent materials for use as a spacer layer between two magnetic layers.

11. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. as modified by Hokkyo et al. as applied to claims 1-7, 9-10 and 12-13 above, and further in view of Kanbe et al. (US6221508).

Sugita et al. as modified by Hokkyo et al. teaches all of the limitations of claim 14 as stated above, except for those limitations stated below.

Sugita et al. as modified by Hokkyo et al. does not teach a magnetic recording apparatus comprising a magnetic recording medium, a driving means to drive the magnetic recording medium in a recording direction, a magnetic head provided with a recording section and a reproducing section, a means to relatively move the magnetic head against the magnetic recording medium, and a recording/reproducing signal treating means to input recording signals to the magnetic head and to output reproducing signals from the magnetic head, wherein the magnetic recording medium is a magnetic recording medium as defined in claim 1.

Kanbe et al. teaches a magnetic storage apparatus that comprises a magnetic head assembly, a head drive unit, a processor unit for processing recording and playback signals from the head, a magnetic medium, and a drive unit for rotation of the magnetic medium (column 6, lines 20-32). The magnetic head comprises a recording and a reading element (column 6, lines 35-37). The magnetic medium is a multilayer magnetic media comprising a substrate, 1 or more underlayers, a recording layer, and a protective layer (column 7, lines 24-49).

Therefore it would have been obvious to one with ordinary skill in the art to utilize the magnetic recording medium described by Sugita et al. as modified by Hokkyo et al. in the magnetic recording apparatus described by Kanbe et al.

One would have been motivated to utilize the recording media of Sugita et al. in a recording apparatus such as that described by Kanbe et al. due to the teaching in Kanbe et al. that such an apparatus is suitable for reading and recording magnetic media that comprises at the most basic level a substrate, one or more underlayers, and recording layer, and the teachings in Sugita et al. as modified by Hokkyo et al. of a magnetic recording media that comprises a substrate, multiple underlayers, and a recording layer.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

nju
July 27, 2002

Vivian Chen
Primary Examiner